

**ABSTRACT**

A semiconductor device having a composite dielectric layer, including a semiconductor substrate, alternating sub-layers including a first dielectric material and a second dielectric material on the semiconductor substrate, the sub-layers forming a composite dielectric layer having at least two sub-layers of at least one of the first dielectric material and the second dielectric material, in which one of the first dielectric material and the second dielectric material is a high-K dielectric material and an other of the first dielectric material and the second dielectric material is a standard-K dielectric material comprising aluminum oxide; and the composite dielectric layer includes a reaction product of the high-K dielectric material and the standard-K dielectric material. In one embodiment, the composite dielectric layer includes a substantially uniform layer of the reaction product of the first dielectric material and the second dielectric material